Variation in Costa Rican Ophioglossum palmatum and Nomenclature of the Species

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In establishing the monotypic genus *Cheiroglossa,* Presl (1845, p. 57) segregated *Ophioglossum palmatum* on the following basis: "Differt ab Ophioglosso habitu, reticulo venarum simplici, ortu spicarum plurium e margine frondis, ab Ophiodermate fronde revera stipitata, venulis secundariis intra maculas et ad maculas marginales liberis, spicis pluribus ad basim frondis marginalibus."

Presl (1845, p. 56) also accepted the epiphytic and monotypic genus *Ophioderma* (Blume) Endl., which differs from *Ophioglossum sensu stricto* and from *Cheiroglossa* in having fronds that are narrow, strap-shaped, and entire or rarely forked at the apex, and in the median, basal position of a single or a pair of fertile segments: "Sed Ophioderma ab Ophioglosso revera differt non solum habitu frondis fasciaeformi, sed praesertim venarum maculis simplicibus, venulis liberis nullis, exortu laterali spicae e vena media frondis."

In the "Index Filicum" Christensen recognized neither segregate; Nakai (1925) rejected *Cheiroglossa* as a genus but upheld *Ophioderma;* Clausen (1938, p. 111) considered *Cheiroglossa* and *Ophioderma* to be subgenera of *Ophioglossum;* and Copeland (1947, p. 11) also submerged both into that genus, stating that a number of species are intermediate and link the three genera.

Although there may be no cytological differences (Ninan, 1958), there are a number of morphological and anatomical reasons for separation at the subgeneric level (Chrysler, 1941; Nishida, 1952; Clausen, 1954, pp. 496–498; Maroti, 1965; van Cotthem, 1973).

Several species and varieties have been proposed in subg. *Cheiroglossa. Cheiroglossa malgassica* (C. Chr.) Pic. Ser., from Madagascar, Réunion, and the Seychelles Islands, differs from typical *O. palmatum* in having smaller fronds and areoles, in the fertile segments mostly inserted near the base of the sterile blade, and in a less deeply incised and thicker lamina and uniformly thick veins. *Cheiroglossa louisii* (Taton) Pic. Ser., from the Congo, has dichotomously segmented fronds with very long, narrow segments, hexagonal, elongate areoles with few included veinlets, and the fertile segments sometimes furcate. Only two collections are known of this species. *Cheiroglossa austrobrasiliensis* Brade, from Brazil, differs in lamina dimensions and color of the sterile segment and common petiole. It has narrow areoles, and the fertile segments are inserted both on the petiole and on the margins of the sterile segment.

The present study is based on six large clumps of *O. palmatum* collected at San Rafael de Vara Blanca, Province of Heredia, at 2000 m altitude. The plants grew as epiphytes on various trees, mostly *Quercus* sp. and *Magnolia poasana* Standl., together with other epiphytes, including Orchidaceae, Bromeliaceae, Araceae, and bryophytes. The area is a montane cloud forest, with rainfall averaging 3000 mm/year and temperatures 18°C. Voucher specimens are: *Wagner & Gómez 1181* (CR), *Lent 1615* (F), and *Gómez 5070* (CR), and totalled 57 fertile fronds.

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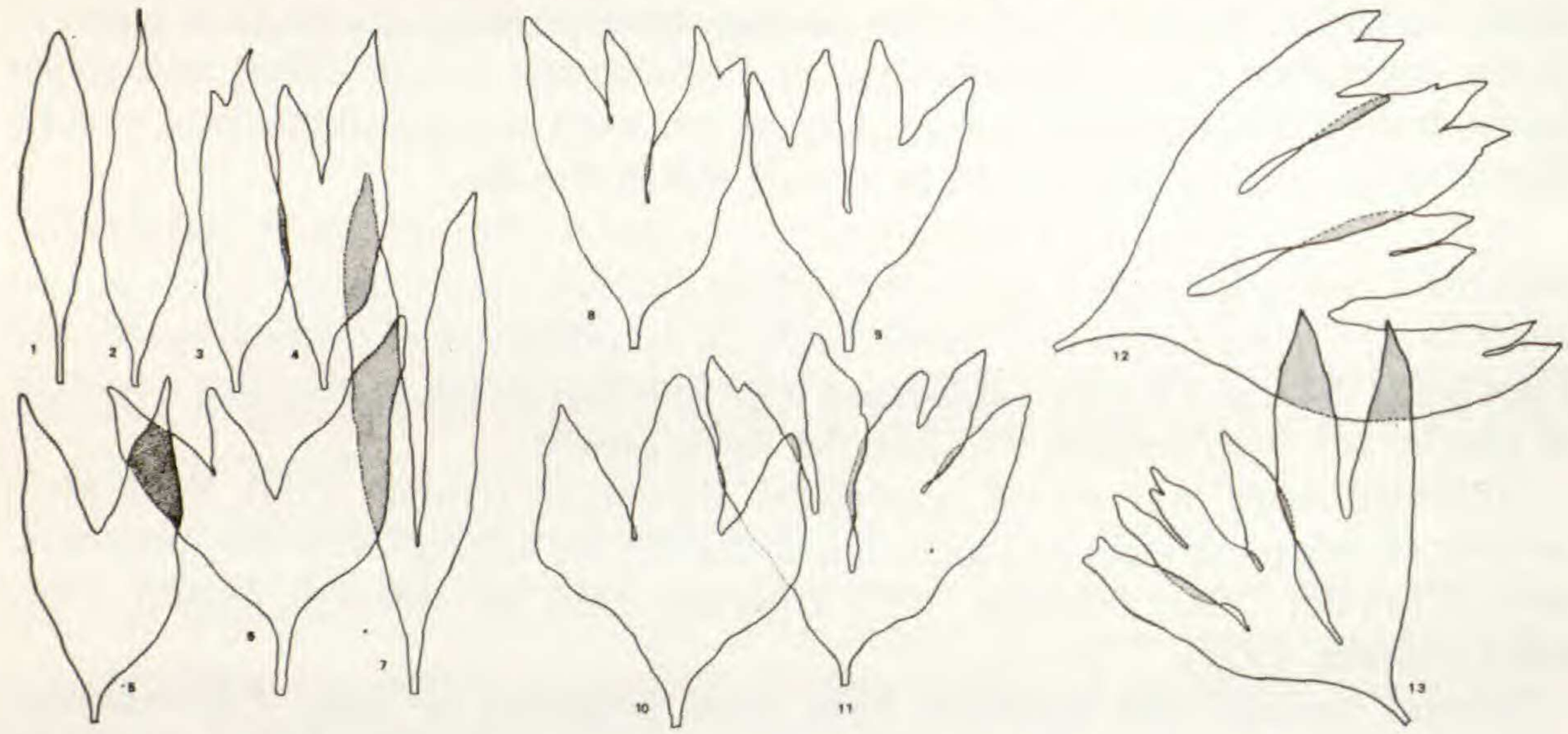
Leaf Shape.—The juvenile leaves of *O. palmatum* are dichotomously lobed from the earliest stages. In cases where the leaf is spathulate with a roundish apex, a median cleft is soon formed. The lamina is very thick, fleshy, and lustrous, and disproportionately short compared to the long, robust petiole.

I have considered as mature and suitable for analysis those leaves which had ripe or dehiscent fertile segments. *Figures 1-3* are simple blades, one of them slightly and irregularly cleft. Such leaves are not common and may be considered as abnormal for the species. *Figures 4, 5, 7,* and *9* depict more or less dichotomously lobed leaves, from slightly cleft to deeply so. *Figures 6* and *8* show irregular, dichotomous forking. *Figure 10* corresponds to a tripartite leaf. *Figures 11-13* are the usual large, old leaves with few to many lobes. Sinuses and segments are not generally alike in a single frond, nor are they uniform within a population.



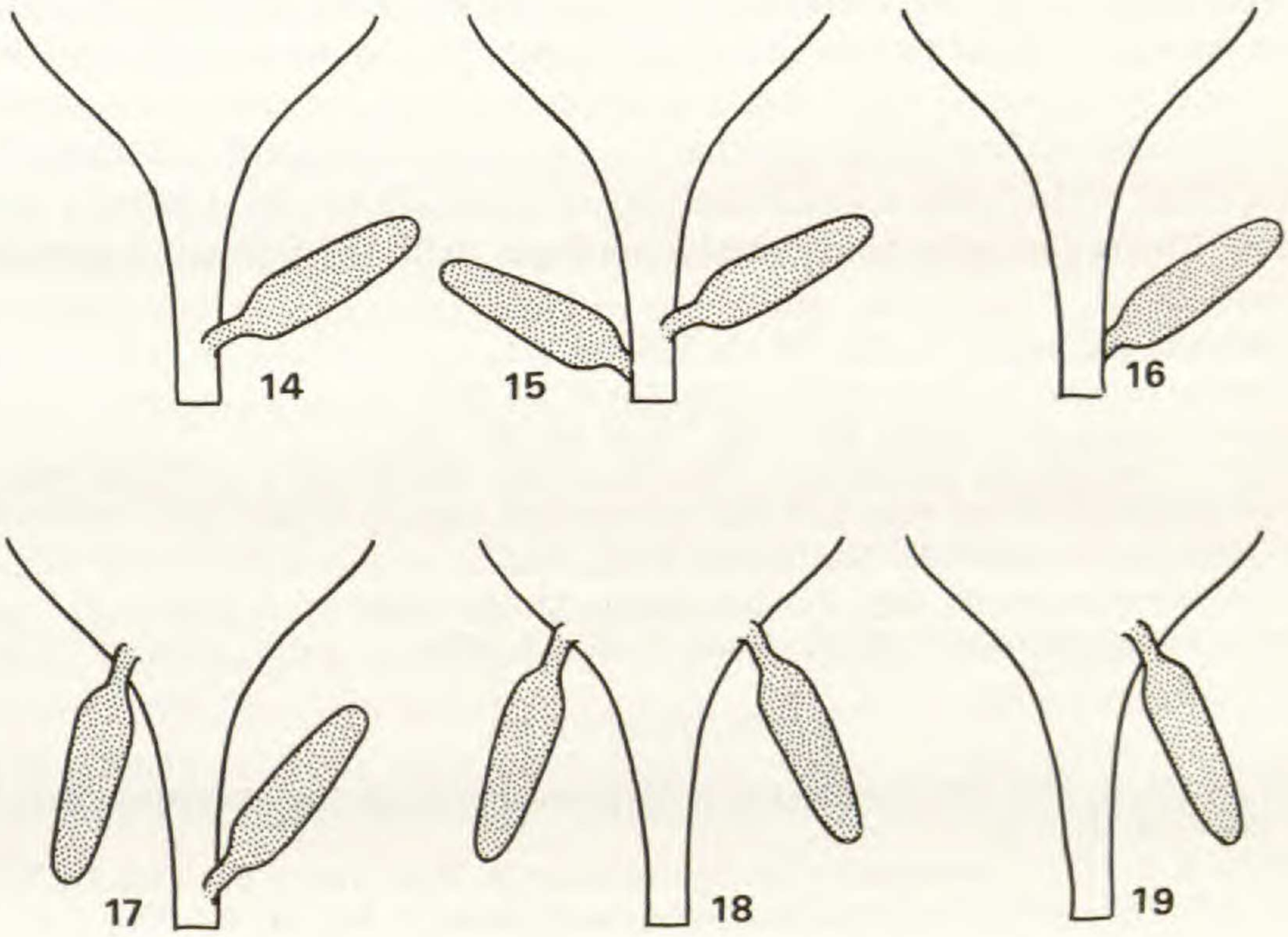
Sterile blades of *Ophioglossum palmatum*. FIGS. 1-3. Simple blades. FIGS. 4, 5, 7 and 9. Regularly dichotomously lobed blades. FIGS. 6, 8. Irregularly dichotomously lobed blades. FIG. 10. Tripartitely lobed blade. FIGS. 11-13. Large, variously lobed blades.

Leaf Size.—The size of mature fronds varies greatly. Length was measured from the base of the blade to the tip of the longest lobe, and is 5–30 cm, with a mean of 17.8 cm. Width, measured transversely at the arithmetic half of the longitudinal axis, is 3.5–24.7 cm, with a mean of 9.3 cm. Apparently there is no constant length/width ratio.

Petioles.—All the petioles examined were terete, glabrous, and slightly furrowed in the area where fertile segments were inserted, due to a low ridge of tissue superimposed on the vascular supply of the fertile segments and their short peduncles. The petioles are 11.5–40 cm long, with a mean of 20 cm.

Fertile Segments.—As a rule the fertile segments are slightly flattened dorsiventrally, obtuse or acutish at the apex, and rounded or truncate at the base. The costa, really a pseudocosta, may be well or poorly defined. The fertile segments are 1.5–6 cm long, with a mean of 4.1 cm, and 0.4–1 cm wide, with a mean of 0.5 cm. The peduncles subtending the fertile segments are 3–12 mm long. The number of marginal pairs of sporangia is 7–41, with a mean of 17.

Fertile Segment Insertion.—The fertile segments of *O. palmatum* are inserted variously on the petiole, the lamina, or both. I have distinguished six types of insertion: (1) adaxial petiolar (*Fig. 14*), with the sporophylls only on the adaxial side of the petiole, in 18 (31.57%) of the fronds; (2) mixed petiolar (*Fig. 15*), with the sterile segments inserted on the adaxial and abaxial sides of the petiole, in 3 (5.26%) of the fronds; (3) abaxial petiolar (*Fig. 16*), with the sterile segments inserted only on the abaxial side of the petiole, in 2 (3.50%) of the fronds; (4) laminar/petiolar (*Fig. 17*), with fertile segments inserted both on the petiole, either adaxially or abaxially, or on the lamina, in 15 (26.31%) of the fronds; (5) marginal laminar (*Fig. 18*), with fertile segments inserted only on the lamina margins, in 9 (15.78%) of the fronds; and (6) superficial laminar (*Fig. 19*), with fertile segments inserted only on the lamina surface, leaving a discernible space between the point of insertion and the margin of the sterile blade, in 4 (7.01%) of the fronds. A mixed condition of superficial and marginal laminar fertile segments was found in one frond (1.33%).



Insertion of fertile segments on *Ophioglossum palmatum* blades. FIG. 14. Adaxial petiolar insertion. FIG. 15. Mixed petiolar insertion. FIG. 16. Abaxial petiolar insertion. FIG. 17. Laminar/petiolar insertion. FIG. 18. Marginal laminar insertion. FIG. 19. Superficial laminar insertion.

Blade Venation.—The areoles formed by the anastomosing veins, which have been used to differentiate some supposed species of *Cheiroglossa,* were found in the material studied to be variable in size and shape, with no constant length/width ratio apparent. They are 8–35 mm long, with a mean of 22.7 mm, and 1.9–7.5 mm wide, with a mean of 3.9 mm. The foregoing measurements are from ten areoles on each blade of the 57 studied, chosen at random along the line used to measure blade length.

One of the distinguishing characters proposed by Presl to differentiate *Cheiroglossa* from *Ophioderma* was the absence of marginal free veinlets in the latter genus. In the fronds of *O. palmatum* studied, free marginal veinlets ranged from none to many, often in the same plant; obviously such a character is insufficient for generic circumscription.

Indument.—Neither the scales, which cover the rhizome apex, nor the trichomes found at the base of the petiole, show any structural peculiarities that make them useful taxonomically. Likewise, the wooly tomentum of some *Botrychium* species should not be used to segregate taxa. In addition to the material cited above, the following specimens were examined for their indument: Cerro de Zurquí, 2000 m, *Gómez 3505* (CR); Santa Cruz de Turrialba, 1500 m, *Poveda* (CR 59852); Around San Ramón, Pcia. Alajuela, *Brenes 179* (CR); Alto de Pacuare, *Gómez 3436* (CR).

Spores.—The spores seen through a light microscope are quite uniform. It is possible that the scanning electron microscope would reveal some variation in spore wall sculpturing that correlates with habitat or geographical distribution.

From the above, I feel certain that *O. palmatum* L. is quite variable and that the criteria used to segregate other taxa are not consistent. Nevertheless, there may be some constant, infraspecific taxa that have a distinct geographical range. But to discover these will require careful analyses of populations. At present I propose that subg. *Cheiroglossa* be considered monotypic, with the following synonymy:

Ophioglossum palmatum L. Sp. Pl. 2: 1062. 1753.

Cheiroglossa palmata (L.) Presl, Suppl. Tent. Pterid.: 57. 1845.
Ophioderma palmata (L.) Nakai, Bot. Mag. Tokyo **39:** 193. 1925.
Cheiroglossa palmata var. *malgassica* C. Chr. Dansk Bot. Ark. **7:** 185, *t. 74, f. 4-5*. 1932.
Ophioglossum louisii Taton, Bull. Jard. Bot. Bruxelles **17:** 118, *t. 2*. 1944.
Cheiroglossa louisii (Taton) Pic. Ser. Webbia **9:** 625. 1954.
Cheiroglossa malgassica (C. Chr.) Pic. Ser. Webbia **23:** 168. 1968.
Cheiroglossa austrobrasiliensis Brade, Bradea **1:** 30, *t. 1*. 1970.

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